HIGHLIGHTS

Robert S. Kerr Environmental Research Laboratory

Status Report for the Week of February 17, 1992

ACQUISITION OF GROUND-WATER QUALITY SAMPLES FOR METALS

For the past four years RSKERL has evaluated sampling procedures for the collection of representative, accurate, and reproducible ground-water samples for metals analysis. Research at three different field sites has shown that the method by which samples are collected has a greater impact on sample quality, accuracy, and reproducibility than whether the samples are filtered or not. The research has shown that sample collection practices which induce artificially high levels of turbidity have the greatest negative impact on sample quality with respect to metals analyses. As a result of this work, the RSKERL research team recommends the use of low flow rates during both purging and sampling, placing the sampling intake at the desired sampling point, minimal disturbance of the stagnant water column above the screened interval, monitoring water quality indicators during purging, minimization of atmospheric contact with samples, and the collection of unfiltered samples for metals analyses.

At Pinal Creek near Globe, AZ, at a copper mining waste site, research showed that the use of a high speed (12-92 L/min) submersible pump produced excessive turbidity, larger suspended particles, and the greatest difference in metals concentrations between filtered and unfiltered samples (Puls, R.W. and M.J. Barcelona. Hazardous Waste & Hazardous Materials, V.6, No.4, 1989 and Puls, R.W., J.H. Eychaner, and R.M. Powell. EPA/600/M-90/023, Dec., 1990). During purging and sampling several water quality parameters were continuously monitored. It was observed that pH, temperature, and specific conductance equilibrated in less than 1 casing volume, while dissolved oxygen and redox generally required 1-2 casing volumes, and turbidity slightly more using a bladder pump at 0.6 L/min.

The second site studied was a chrome tannery site near Saco, ME. Research here demonstrated the ineffectiveness of dedicated bailers for the collection of representative metal samples. Inconsistent operator usage together with excessive purging generally resulted in excessive turbidity (>100 NTUs) and large differences in concentrations between filtered and unfiltered metal samples (Puls, R.W., R.M. Powell, D.A. Clark, and C.J. Paul. EPA/600/M/M-91/040, July, 1990). The use of low rate purging with a peristaltic pump (0.2-0.3 L/min) consistently produced filtered and unfiltered samples which showed no significant differences in metals concentrations. Turbidity levels were generally less than 5 NTUs, even in the fine textured glacial till overburden wells. The response of ground-water quality indicators was similar to that observed at Globe except that the parameters often equilibrated faster with the slightly lower pumping rates used at Saco.

The third site was a chrome plating facility near Elizabeth City, NC, where several sampling devices were evaluated including a bailer, and peristaltic, bladder, and low-speed submersible pumps. As at the other sites, indicator water quality parameters were continuously monitored during purging and sample collection. Similar to the other sites, specific conductance, pH, and temperature were the least sensitive parameters monitored, attaining steady state quickly. Dissolved oxygen, redox, and turbidity were more sensitive, as were chromium concentrations, with equilibrium being reached in less than 3 casing volumes with low flow rates (0.2-0.5 L/min). With exception of the bailer, the other devices produced filtered and unfiltered concentrations which were not significantly different. Not only were the bailed filtered and unfiltered samples significantly different, but the unfiltered values were 2 to 3 times higher than peristaltic values.

As a result of this research, the Saco and Auburn Road Superfund Sites have recently implemented its findings in monitoring at the sites, and preliminary results are consistent with those of RSKERL. It is intuitively obvious that the proposed methods induce the least disturbance to the sampled zones producing low turbidity samples with minimal handling and negligible chemical or physical alterations. While additional time is spent due to the use of low flow rates, compensation is obtained by eliminating the need for filtration, decreased volume of purged water during sampling, and the need for less resampling to address inconsistent data results.

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